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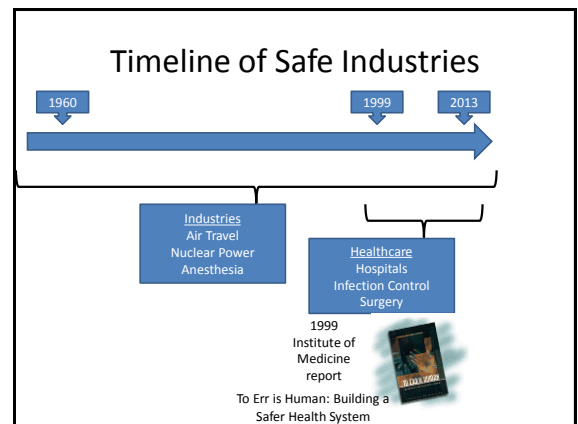
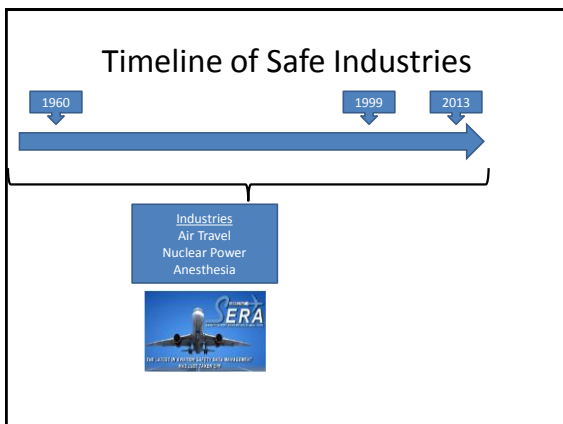


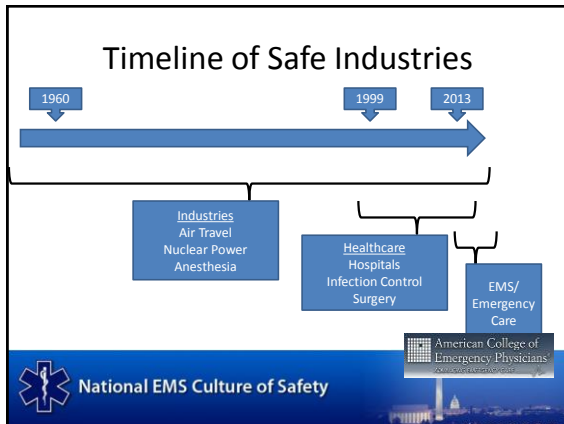
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Commonwealth EMS Medical Director  
**Pennsylvania Department of Health**



## Outline

The Problem  
Provider Safety  
Patient Safety  
Creating a Culture of Safety





## Primum non nocere



### Challenges to Safety in EMS/ Emergency Care

- Time urgency
- Interruptions
- Uncontrolled environment
- Stress
- Multiple and overlapping patient encounters
- Unscheduled care
- Incomplete patient historical data
- Unpredictable patient presenting conditions
- Variable initial training and continuing education

## Outline

### The Problem

#### – EMS Risks

Provider Safety  
Patient Safety  
Creating a Culture of Safety



## EMS Patient Safety Themes from Published Literature

- Clinical judgment
- Adverse events and error reporting
- Communications
- Ground vehicle safety
- Aircraft safety
- Interfacility transport
- Field intubation

Bigham BL, et al. Prehosp Emerg Care 2012;16:20-35.

## Insurance Industry

### Top EMS risks

#### Injuries to patients:

1. during carrying/moving
2. in ambulance crashes
3. from medication error
4. from procedure errors (misplaced endotracheal tube)

## EMS Risks

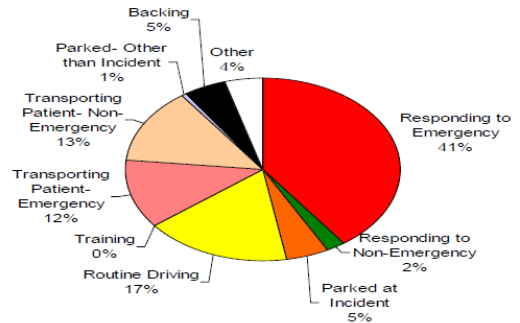
### EMS Provider Work-Related Fatalities

- 12.7/100,000 EMS workers
- Similar to PD and FD
- 250% higher risk than average workers
- Transportation risk 500% higher than average
  - exceeds PD and FD

## EMS Risks Air Medical Crew Risks

- 2008 9 crashes/ 28 fatalities
- Deaths over 10 years
  - HEMS crew 113/100,000 employees
  - AK Fishermen 111/100,000 employees
  - Police Officer 21/100,000 employees

## Vehicle Response Mode at Time of Crash



## Safety Culture?



## Outline

### The Problem

#### Provider Safety

- Human Factors
- Vehicle Operations
- Vehicle Design
- Outside of the Vehicle

#### Patient Safety

#### Creating a Culture of Safety



## Human Factors

- Fatigue
  - 21 hours awake = 0.08 BAC
  - **Shifts/ Duty Hour Limits**
- Distractions
  - Radio
  - Cell phone
  - Pager
  - Texting



## Human Factors

### **“Sterile Cockpit” Concept**

- Short-final vs. L&S response
- No unnecessary/ non-mission conversation
- Zero tolerance for driver:
  - cell phone use
  - viewing pager
  - texting
- Co-pilot assists with:
  - radio
  - navigation
  - watching traffic

## Vehicle Operations Seatbelt/ Restraint Use

- Pennsylvania Statewide Protocol (since 2004)
  - Driver and cab passenger
  - All non-EMS passengers
  - All patients
  - Children in child seats
  - EMS personnel not performing direct patient care
- Prevention
  - **Use of existing restraints is possible most of the time !!**
  - **We must work to minimize time out of restraints !!**
  - Eliminate (almost) CPR during transportation



## GEISINGER Seatbelt Usage by Emergency Medical Service Providers

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**INTRODUCTION AND PURPOSE**

Major vehicle accidents have become the leading cause for the job injury or death of EMS providers. It is well established that the use of seatbelts results in a significant increase of morbidity and mortality for occupants that are unrestrained. In a study, the authors found that the most common cause of death among EMS providers was a motor vehicle accident. The purpose of this study was to determine the use of seatbelts by EMS providers in a general hospital setting.

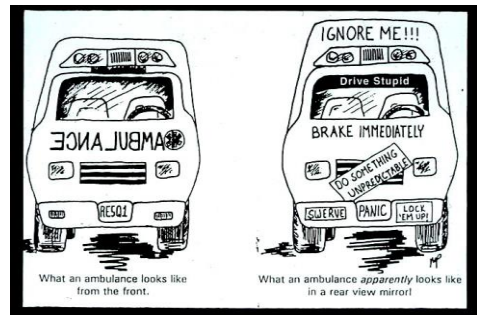
**RESULTS**

An analysis of 100 EMS providers who were consistently wearing seatbelts in the ambulance. The authors found that the most common cause of death among EMS providers was a motor vehicle accident. The purpose of this study was to determine the use of seatbelts by EMS providers in a general hospital setting.

**CONCLUSIONS**

The authors of this study found that the use of seatbelts by EMS providers was significantly higher than in the general population. The authors found that the most common cause of death among EMS providers was a motor vehicle accident. The purpose of this study was to determine the use of seatbelts by EMS providers in a general hospital setting.

## Vehicle Operations Lights & Siren Effectiveness



## Warning lights/ sirens

- Culture of safe practices far outweigh additional wattage/ LEDs/ decibels



## Reasons for L&S Use

- ~~Time (fire analogy)~~
- ~~Required by insurance company~~
- Tradition
- Fun
- Medical Emergency

## Time Savings Studies

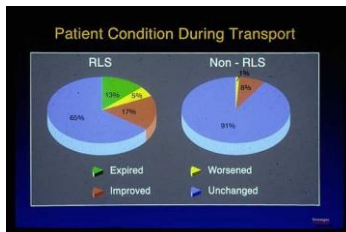
- Greenville, NC (*Ann Emerg Med*, 1995)
  - Hunt RL, Brown LH, et al.
  - 43.5 seconds saved
- Minneapolis, MN (*Ann Emerg Med*, 1999)
  - Ho J, Casey B, et al.
  - 3.02 min saved
- Syracuse, NY (*Ann Emerg Med*, 2000)
  - Brown LH, Hunt RL, et al.
  - 1 min 46 seconds saved

## Vehicle Operations L&S Use During Response

- No evidence for L&S response to:
  - Inter-facility transfer
  - CO detector activation
  - Fire Stand-by
  - LifeLine activation
  - MVC with unknown injuries
  - Nursing home or physician's office for non-cardiac arrest
- Benchmark for L&S 911 response (? 25%)

## Kupas DF, Dula DJ, Pino BJ. *Prehosp Disaster Med*, 1994

- Medical criteria for L&S transport
- 8% L&S transport



## Medical Indications for L&S Transport

- Time dependent (minutes) medical emergency
  - Airway compromise
  - Impending cardiac arrest
- Inappropriate L&S transport examples
  - STEMI
  - Stroke
  - ? Cardiac Arrest with CPR in progress
- Benchmark – L&S transport = sentinel event

DEAF 00000000 L.C. # ME 00000000

NAME \_\_\_\_\_ AGE \_\_\_\_\_

ADDRESS \_\_\_\_\_ DATE \_\_\_\_\_

R Lights and Siren

Sig: Dispense one L&S transport, Use sparingly prn

REFILL 0 1 2 3 4 5 PRN

(SIGNATURE) \_\_\_\_\_

## Culture of Safety



Reducing lights and siren response and eliminating almost all lights and siren transport decreases crash risk for EMS providers and patients

## Vehicle Operations Driver Feedback Systems

- Levick N, Little Rock EMS
- Reduce accidents
- Increase vehicle life
- Richmond, VA
  - Decreased accidents
  - 28% decrease accident repair cost
  - \$1364 savings/ vehicle





## Why the Difference?



## Vehicle Design Visibility

- **Vehicle Color**
- **Retroreflective chevron/ material**
- **Warning lights**



## Uniqueness May Be Dangerous



## Policy and practice ignorant of existing technical safety data

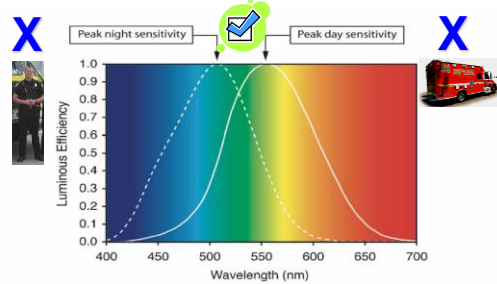


Figure 1. The scotopic (dashed line) and photopic (solid line) luminous efficiency functions, describing the spectral sensitivities of night and day vision, respectively.

## Visibility





## Ambulance Safety Awareness Program



## Vehicle Design Rear Compartment Characteristics



## Vehicle Design Rear Compartment Characteristics



## Vehicle Design European EMS Vehicles

- Mercedes Sprinter
- Crash testing for EMS vehicles
- **High-visibility**
- **Retroreflective chevron**
- **Forward-facing crew seat**
- Secured equipment
- Hydraulic patient lifts



## Outside of the Vehicle

- **Environmental CO detectors**
- Wellness Program
  - Biggest Loser
- Back Injury Prevention
  - Weight of bags/ equipment
  - Power-lift stretchers
  - Stair devices High-visibility wear
  - **ANSI II/III highway requirements**
  - **Boots on the ground = Hi-Viz policy**



## Outline

The Problem

Provider Safety

### Patient Safety

- Transition/ Hand-over
- Checklists
- Medications
- Equipment

Creating a Culture of Safety



## Opportunity for Safety Hand-off/Hand-over/ Transfer of Care



The Joint Commission

Joint Commission  
International

World Health  
Organization

WHO Collaborating Centre for Patient Safety Solutions

Aide Memoire

## Communication During Patient Hand-Over

Patient Safety Solutions  
| volume 1, solution 3 | May 2007









## Opportunity for Safety Technology

- Technology can reduce errors due to human factors, for example:
  - Capnography eliminates misplaced endotracheal tubes
  - Environmental carbon monoxide monitoring ensures scene safety and identifies CO poisoning
- Caution – technology can both reduce and create patient safety issues (for example electronic EMS patient record)



## Outline

The Problem  
Provider Safety  
Patient Safety

### Creating a Culture of Safety

- Adverse Event Reporting
- Just Culture
- Safety Committee



## Categories of Patient Outcome from Error

- Potential to cause harm
- Error occurred but did not reach the patient
- Error reached patient but did not result in harm
- Error reached patient and required intervention to prevent harm
- Temporary harm requiring intervention
- Temporary harm requiring increased length of stay
- Permanent harm
- Life-saving intervention required
- Death



## Adverse Event (AE) Reporting What are the risks to our patients?

- Early AE Reporting Systems
  - Vaccine safety
  - Medical device safety
  - Transfusion reaction
- Other Sources of Information
  - Insurance databases
  - Government databases
- EMS Safety Event Reporting



## Pennsylvania EMS Safety Event Reporting (established 2003)

The screenshot shows the homepage of the Pennsylvania EMS Safety Event Reporting System. It includes a navigation menu on the left with links to 'DEPARTMENT OF HEALTH HOME', 'DEPARTMENT OF HEALTH INFORMATION', 'HEALTH TOPICS A-Z', 'BIRTH AND DEATH CERTIFICATES', 'HEALTHY LIVING', 'HEALTHY SCHOOLS, BUSINESSES AND COMMUNITIES', 'HEALTH STATISTICS AND RESEARCH', and 'HEALTH SERVICES AND RESOURCES'. The main content area is titled 'EMS Safety Event Reporting System' and contains a welcome message, a definition of a safety event, and instructions on how to report an event. It also mentions that the system is anonymous and that reports are used for system improvement.

## Pennsylvania EMS Safety Event Reporting Results

- Summary of Pennsylvania EMS AEs
- 415 events reported anonymously
- Patient safety reports classified as:

32% Action/behavior	7% Level of care
16% Vehicle/transportation	6% Medical Procedures
13% Ambulance availability	5% Medication error
9% Medical equipment	3% Scene safety
8% Communication	1% Protocol issue

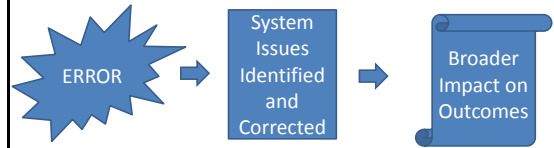
Gallagher JM, Kupas DF Prehosp Emerg Care 2012 Jan;16(1):36-42



Formerly PA EMS Safety  
Event Reporting System

<http://event.clirems.org>

## Just Culture No Blame



To err is human, to forgive divine  
— Alexander Pope, 1711

## EMS Safety Culture



Must be required and supported  
from top management to  
frontline providers

## EMS Agency Safety

- **Start a Safety Committee**
  - In PA, 5% reduction in Worker's Comp insurance
- **Safety Rounds in vehicles and stations**
- **Event Reporting (non-punitive)**
- **Review personnel scheduling**
- **Agency Policies**
  - Seat Belt
  - L&S Use
  - Distracted Driver/Sterile Cockpit
  - **Drug storage/ pharmaceutical practices**



## Opportunity for Safety A Culture of Safety





## Safety Culture Summary Right NOW (and inexpensive)

- Culture of Safety
  - EMS Agency Safety Committee and Safety Rounds
  - Agency policies (buy-in/ enforcement)
  - Just culture
- Wear seatbelts/restraints at almost all times!
- Minimize L&S response
- Eliminate almost all L&S transport
- Being visible should outweigh tradition/ uniqueness
- Consider safer vehicles with forward facing seats
- Sterile cockpit/ limited telecommunication by driver

## Conclusion

- Apply general healthcare patient safety principles to EMS
- Actively collect and analyze safety risks in our EMS systems
- Use checklists and incorporate best practice guidelines when possible
- Use structured process for transfer of care
- Develop a true culture of safety across EMS

## Patient Safety Resources

- Emergency Medicine Patient Safety Foundation
  - <http://www.empsf.org>
- Institute for Safe Medication Practices
  - <http://www.ismp.org>
- World Health Organization
  - <http://www.who.int/patientsafety>
- Institute for Health Improvement
  - <http://www.int.org>

